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Survey on Conventional Solid Waste Management Techniques in the City of Vellore

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ABSTRACT

The objective of this study was to find out the various methods adopted by the residents to dispose the domestic wastes from households with the help of a field survey conducted in Vellore. The effectiveness of this process was analysed and interpreted in graphical and statistical format. The area under survey consists of high-density residential groups including educated and well-off people as well as illiterate daily wage workers. Results from the survey showed that 66 percentages of the residents rely on the amenities provided by the Vellore Municipal Corporation for discarding their household wastes. A field trip to the corporation office and government composting shed near Darapadaveedu zone 1, showed that the wastes collected are being recycled safely as: compost, landfills, bioconversion to fertilizers and other industrial uses.

INTRODUCTION

In layman terms, solid wastes can be defined as any unwanted and useless solid material produced broadly by domestic, agricultural, industrial and commercial field. They usually include garbage, sludge and other futile solid and semi-solid components. The toxicity of solid waste depends upon the source and type of waste generated. Non-toxic wastes are the bio- degradable ones generated from house, street and market; whereas the toxic wastes include the ones that are produced from hospitals and industries. Solid waste can be categorized into three based on the source of waste generation: municipal solid waste, industrial solid waste and biomedical waste (hospital waste). In each city, the municipalities play a major role in regulating the household wastes (Dyson et al 2005)

The rate of waste generation is exponentially increasing every day, throughout the world which is indeed an alarming situation. The amount of waste production has tripled since 1960.Reports reveal that the world cities generate 2.01 billion tones which sum up-to a footprint of 0.74 kilograms per person per day as of 2016. The annual waste generation is expected to increase by 70% from 2016 to 3.40 billion tonnes in 2050 (Bundela et al 2010). According to Press Information Bureau, India alone generates 62 million tons of waste (recyclable and non- recyclable) every year (Huang et al 1992). Rapid population growth and urbanization serve as the main causes (Guerrero et al 2013). This scenario poses a great threat to the sustainability of the environment and degradation of public health. Therefore, efficient waste management plays a crucial role (Tarmudi et al 2012).

Developed nations possess complex and sustainable waste disposal techniques (Sakai et al

1996). In contrast, less developed or developing countries which does not have sustainable waste management methods, tend to dispose them in barren lands (dump) or burn them in open grounds (Sharholy *et al* 2007). Inefficiently managed solid waste serves as breeding ground for disease vectors, contributes to global climate change through methane gas generation and destroys the aesthetic value of that arena as well (Sawell *et al* 1996). Thus, it poses a serious menace to safety levels of health and environment (Singh *et al* 2011).

Some of the prominent solid waste management techniques include sanitary landfill, incineration, composting, pyrolysis,

recovery and recycling (Zhen-Shan *et al* 2009). Sanitary landfill is an age-old technique in which a large hole is dug in the ground, lined by plastic or clay and is layered by waste and soil (Hokkanen *et al* 1997). Landfills can potentially pollute the surrounding environment (soil and underground water) as well as produce climatic change by releasing methane gas during degradation (Idris *et al* 2004). Incineration involves burning of wastes at a high temperature, enough to convert them into ashes. In spite of marked air pollution, incineration is preferred in most cases because it helps in reducing the volume of the wastes up to 20-30% of the original waste. Composting is a process in which biodegradable wastes are decomposed in a medium and used as soil conditioners for agricultural purposes (Hartmann *et al* 2006). Pyrolysis involves chemical decomposition of solid waste by heat without the presence of oxygen. In this case, the wastes are converted into gas, solid residues and small amounts of liquid. The high operating temperature in pyrolysis reduces the volume of waste as well as degrades pathogen from the waste materials. Reducing and recycling is indeed the best technique of solid waste management. In this, the waste material is processed into a new product. It aims at reducing energy loss, reduction of landfill and creation of a new material.

According to the Tamil Nadu pollution control board, the amount of hazardous waste produced in Vellore is about 18308.324 metric tonnes. At present the greater part of the MSW in the nation is disposed unscientifically. This affects the environment as well as the human condition. Informal transfer rehearses leave squander unattended at the transfer locales, which pulls in birds, rodents, bugs and so on., to the waste and makes unhygienic conditions like smell, arrival of airborne pathogens. Vellore has been on the news headlines for its efficient methods of solid waste disposal. This study aims at identifying the role of Municipal Corporation in waste management and proposing a bioremediation technique for minimizing the levels of hazardous waste especially from tannery industries.

MATERIALS AND METHODS:

His study began with the preparation of a questionnaire to understand the types of solid waste generated by different classes of people in their residential areas, how they dispose it generally, any alternatives if used and also their knowledge on what happens to the waste after collection or disposal. A set of 10 questions were prepared and circulated among the residents of Vellore by two investigators. The survey commenced on 10th of January (Thursday). Data was collected in the form of google sheet and also printed in local language to ensure legibility for the residents from residents of Mr. Dhobi lane and Gandhi Nagar 2nd Street. Investigators went to each home and collected data from affluent as well as indigent classes of the society to incorporate complete information. Data collected was later on tabulated and analysed using statistical methods. The following are the questions incorporated in the survey:

1. What type of solid wastes comes out of your house? 2. How do you usually dispose your household wastes?
3. Do you make use of the municipal corporation facility available for waste disposal?
4. How often do the corporation workers come to collect the waste?
5. Do you usually segregate the waste as biodegradable and non-biodegradable before giving?
6. Do you utilize your kitchen waste as manure for garden plants? 7. Rate your awareness on how municipality process the waste?

8. Have you ever noticed wastes dumped on roadsides/open grounds nearby?
9. What do you think is the most efficient method of waste disposal?
10. Give your rating with respect to the working efficiency of Vellore Municipal Corporation.

RESULTS & DISCUSSION

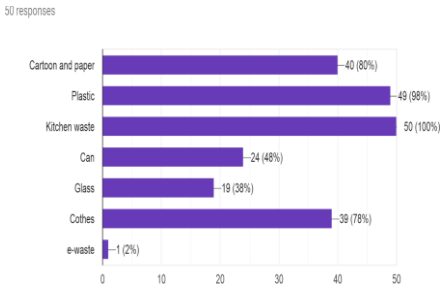
It was observed that among all the methods of waste jettisoning, a majority of 66 percentage of people chose Vellore Municipal Corporation which facilitated periodic waste collection as the prime way of disposing household waste generated.

 The composition of waste is as much a vital segment as its amount in planning SWM [Solid Waste Management] (Colonna et al).

It was perceived that the composition profile of domestic waste in Vellore consist largely of biodegradable kitchen wastes and plastic. Among the 50 houses surveyed, all of them generated kitchen waste and 40 generated plastic. Next in the list was paper and carton, followed by clothes, can, glass and e-Waste at a minimal quantity.

Table 3.1-Types of Solid wastes generated

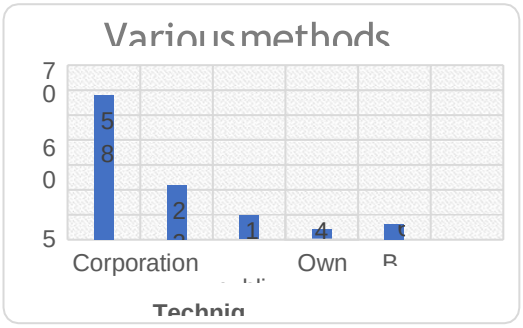
TYPE OF WASTE GENERATED	FREQUENCY
Kitchen waste	50
Plastic	49
Paper and cartons	40
Clothes	39
Cans	24
Glass	19
e-Waste	1



 Among various methods available for solid waste disposal, 58% of residents use corporation waste van and 22 % of residents use public bins provided by the municipal corporation. This clearly shows the trust and dependence of the people towards the corporation facilities in managing solid waste. 10% of residents admitted that they throw the waste on roadsides and open grounds nearby the living areas. 4% of people make use of their own compounds for disposing whereas 3% of **them burn the waste.**

Table 3.2: methods adopted to dispose domestic waste

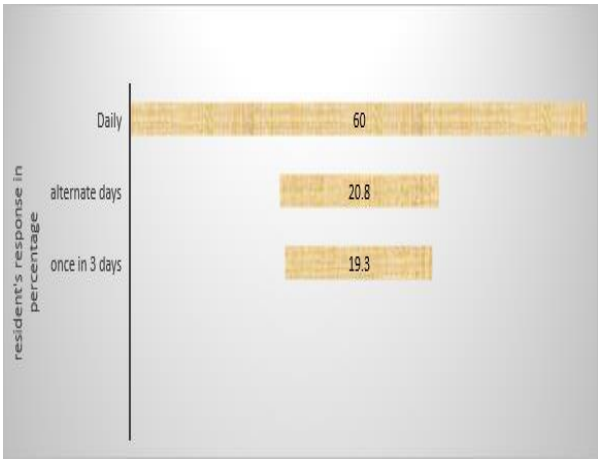
METHOD	FREQUENCY	PERCENTAGE
Corporation waste van	29	58
Public bin	11	22
Road sides/open spaces	5	10
Own compound	2	4
Burn	3	6
Total	50	100



 To test the working efficiency and punctuality of municipal corporation workers, residents were asked how frequently the workers come to pick up the waste. 60% of residents said that workers come on a daily basis. 20.8% residents answered that the workers come on alternate days and 19.2% people said that the waste is picked up once in 3 days.

Table3.3: response on punctuality of corporation workers

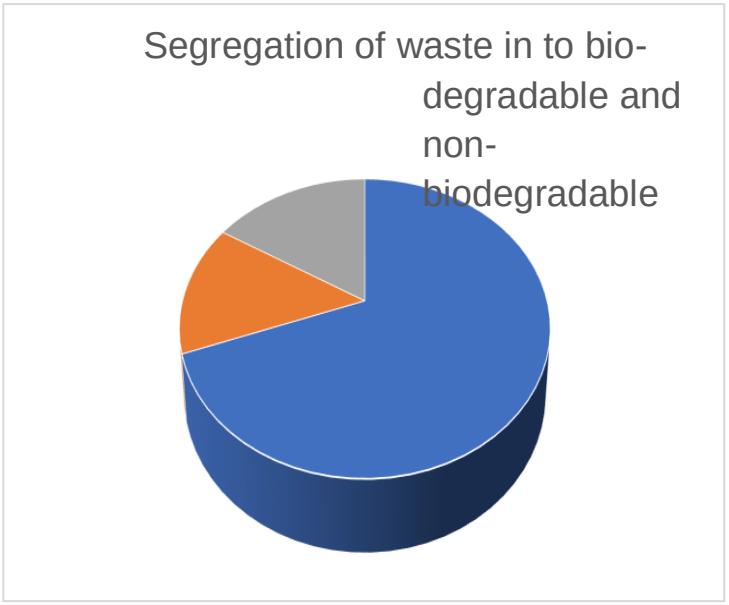
RESPONSE	FREQUENCY	PERCENTAGE
Daily	30	60
Alternate days	15	30
Once in 3 days	5	10
Total	50	100



 The involvement of residents in segregation and better management of solid waste was also tested. In this attempt, it was found that 69.4% of residents segregated the domestic waste generated as bio-degradable and non-biodegradable before giving them away.14.3% of residents were ignorant to segregate whereas 16.3% of them segregated occasionally.

Table 3.4: response of residents on segregation of waste

RESPONSE	FREQUENCY	PERCENTAGE
Segregate	34	69.4
Don't segregate	7	14.3
Occasionally	8	16.3



 It was observed that 44% of residents used their kitchen waste as manure for the garden plants knowingly or un-knowingly aiding in the process of recycling. 18% of residents did the same occasionally while rest where ignorant towards the idea.

Table 3.5: residents recycling kitchen waste for gardening purpose

RESPONSE	FREQUENCY	PERCENTAGE
Used for gardening	22	44
Thrown as kitchen waste	19	38
Occasionally used for gardening	9	18